Interactive Visualization of the Impacts of Climate Change and Response Measures using Augmented Reality

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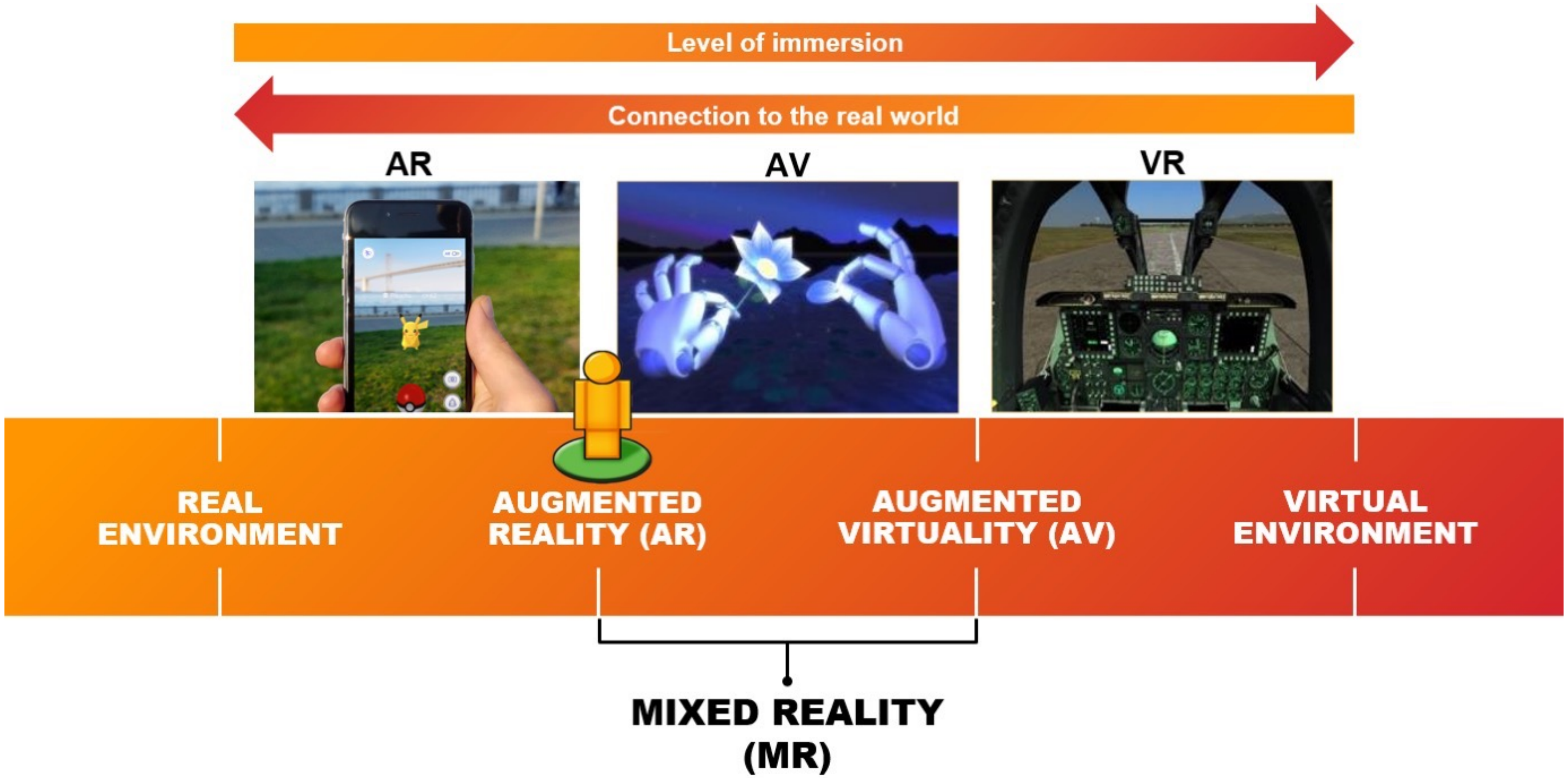
Background

- "Climate change is already affecting every inhabited region across the globe with human influence contributing to many observed changes in weather and climate extremes" - IPCC AR6 WG1 SPM (p. 12)
- Howerver, communicating specifics to non-scientists is difficult
- Models often produce outputs that are multi-layered and complex
  - Hard to understand for decision makers and other stakeholders
- Difficult to visualise trade-offs and benefits of different response measures
- More accessible reports for policy makers are not interactive
- There is a need to create an interactive easily accessible and easy to understand interface for decision makers

Types of Extended Reality Technologies



Why Augmented Reality?

- Augmented reality is by design more suitable for cases where the modelled environment is the same as the user's original environment
  - Simulation in user's environment instead of "transporting" them to a virtual one
- Augmented reality increases engagement and interaction and provides a richer user experience
- More accessible, doesn't require specialised equipment
  - In the form of a mobile application to ensure wide accessibility
  - Can be used "in the field"
- Can be easier to understand and interact with than models
- AR improves communication by making it more immersive with virtual information.
  - Applications in interactive and participative learning, distanced instruction, among others.
- Possibility for collaborative experiences (e.g. in workshops)
- Suitable for co-development with stakeholders

Method 1: In-Situ Augmented Reality

- The simulation will be based on the specific location of the user
- The scene will be overlayed over what the user sees (camera input)
- Data/model results for the specific location will be retrieved and shown to the user

- Helps visualise the impacts of different scenarios/measures on the user’s location
  - Clearer link to the user than more abstract global/regional statistics
- Easier to understand and interact with than models or diagrams

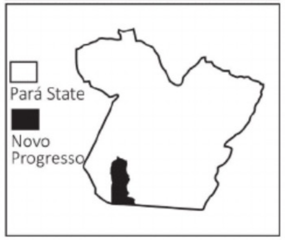
Method 2: Table Top Augmented Reality

- Allows a “bird-eye view” of a larger area
- Can be used as a multiuser simulation (e.g. collaboratively in group activities or workshops)
  - All users can see the same simulation in the same location, but through their own devices
  - All users see the effect of a user making changes/interacting with the model
  - To accomplish this need to synchronise real-world “anchor” points and selected settings across devices
- Can potentially be combined with In-Situ AR in the same application for multiple view points.

Case Study: Community Climate Change Adaptation in Amazonia

- Study site: Novo Progresso region in Brazil

- Community climate adaptation application to plan for changes in crop yields from rainfall change
  - Allows to view predicted rainfall change for any plot of land
  - Crop yield change based on crop grown and soil type
  - Community knowledge input (also improves future users' experience)
  - Plan to include other possible uses of farm land (e.g. grazing)
- Iteration based on stakeholder feedback



Early Results (Iteration 1)

- A first iteration/prototype was tested with stakeholders in the area of Santa Julia in Novo Progresso
- Stakeholders interviewed included local producers, the Secretary of Agriculture, EMATER personnel (state-government company for local rural development) and regional congressmen
- Stakeholders were impressed with the demo and showed a lot of interest in further development
- Based on this first iteration, extra wanted information and further areas for improvement were identified

Case Study: Carbon Storage in Trees

- In-Situ Augmented Reality
- Allows users to “scan” a tree in their environment and see an estimate of the carbon stored in the tree
  - Detects type of tree & tree specific form factors and measures circumference
  - Also provides users with some ”simplified” comparison of what this means
    - e.g. Number of km driven, types boiling kettle, etc…

- In early stages, not yet tested with users

Thank you for your attention

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